REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended claim 1 to recite that the coating layer has the specified gasoline permeability coefficient at "60°C" and the recited relative humidity, consistent with the description in the paragraph bridging pages 41 and 42 of Applicants' specification; to incorporate the subject matter of claim 7 therein; and to further define the multifunctional compound of reactant (B), reacted with (A), or with both (A) and (C), in forming the reaction product which is included in the epoxy resin curing agent. In connection with this further definition of the multifunctional compounds, note, for example, the paragraph bridging pages 23 and 24 of Applicants' specification. In view of amendments to claim 1, claim 7 has been cancelled without prejudice or disclaimer, and dependency of claim 8 has been amended.

In addition, Applicants are adding new claims 19-22 to the application. Claims 19 and 20, each dependent on claim 1, respectively recites a reaction mole ratio of (A) to (B), or (A) to (B) and (C), consistent with the description in the paragraph bridging pages 24-26 of Applicants' specification; and recites a blending proportion of the epoxy resin curing agent to the epoxy resin, consistent with the description in the paragraph bridging pages 26 and 27 of Applicants' specification. Claim 21, also dependent on claim 1, recites a thickness of the coating layer, consistent with the description in the first full paragraph on page 29 of Applicants' specification. Claim 22, dependent on claim 1, recites that the multifunctional compound is selected from the specified derivatives.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the

references applied by the Examiner in rejecting claims in the Office Action mailed April 19, 2006, that is, the teachings of the U.S. Patents to Gerdes, et al., No. 4,719,135, to Carlblom, No. 5,637,365, and to Miyamoto, et al., No. 4,541,958, under the provisions of 35 USC 102 and 35 USC 103.

It is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a fuel system as in the present claims, wherein one or more of the specified components includes a coating layer, the coating layer being formed by curing an epoxy resin composition including an epoxy resin and an epoxy resin curing agent, wherein the epoxy resin curing agent includes a reaction product of (A) and (B), or a reaction product of (A), (B) and (C), the reactants (A), (B) and (C) being set forth in claim 1, and wherein the coating layer has a gasoline permeability coefficient as set forth in claim 1.

Furthermore, it is respectfully submitted that the teachings of these references as applied by the Examiner would have neither disclosed nor would have suggested such a fuel system as in the present claims, which includes one of the specified components having the recited coating layer formed by curing an epoxy resin composition including, inter alia, the specified epoxy resin curing agent, and with gasoline permeability coefficient, as set forth in claim 1, and, moreover, having additional features as set forth in dependent claims in the application, including (but not limited to) wherein the gasoline permeability coefficient is 0.2 $g \cdot mm/m^2 \cdot day$ or less (see claim 2); and/or wherein a skeletal structure represented by Formula (1) as in claim 3 accounts for at least 30% by weight of the coating layer (see claim 3); and/or wherein the epoxy resin is selected from the group thereof as set forth in claims 4-6; and/or further definition of the multifunctional compound (B) as in claim 8; and/or coverage of the coating layer on the fuel vessel body as in claim 9; and/or

material of the thermoplastic resin constituting the fuel vessel body, as in claims 10 and 11; and/or wherein the coating layer is formed on at least one side of the molded part bodies for the fuel vessel, as in claim 12, in particular wherein the molded part bodies for the fuel vessel is of a material as in claims 13 and 14; or wherein the tube is of a material as in claims 15 and 16, with a blending proportion of the epoxy resin curing agent to the epoxy resin in the coating resin layer of the tube body as in claim 17; and/or wherein the coating body is formed on at least one of the connected parts of the body selected from the fuel vessel body, molded part bodies and tube body, as in claim 18; and/or reaction mole ratio of the reactants forming the epoxy resin curing agent, as in claim 19; and/or blending proportion of the epoxy resin curing agent to epoxy resin, as in claim 20; and/or thickness of the coating layer, as in claim 21; and/or wherein the multifunctional compound is selected from the specified derivatives (see claim 22).

The present invention is directed to a fuel system which includes at least one of various components such as, for example, a fuel vessel, molded parts for the fuel vessel and a tube for a fuel. In particular, the present invention is directed to such fuel system having excellent performance in preventing permeation of, e.g., gasoline, while having good heat resistance and impact resistance.

In recent years, use has been made of thermoplastic resins in fuel systems, as compared with use of metal, providing advantages of a reduction in weight, prevention of rust, ease in molding and ability to be recycled. However, in previously proposed fuel systems, various performances, such as heat resistance, water resistance, impact resistance, and avoidance of permeation of gasoline, has not been sufficiently satisfactory.

Against this background, Applicants provide a fuel system excellent in gasoline barrier property, heat resistance and impact resistance, and which also (when used in forming a tube of, e.g., rubber) has excellent flexibility. Moreover, the fuel system can be provided at relatively inexpensive cost, insuring a high profitability. Applicants have found that by forming the fuel system utilizing a thermoplastic resin and/or a rubber as the body of the fuel system, and providing a coating layer on at least one side of the body, the coating layer being formed by curing an epoxy resin composition including, inter alia, an epoxy resin curing agent as in present claim 1; and wherein the coating layer has a gasoline permeability coefficient of 2 g·mm/m^2·day or less at 60°C in a relative humidity of 60%RH, objectives according to the present invention are achieved. In particular, an excellent gas barrier property is achieved, the fuel system has excellent heat and impact resistance, the coating layer has excellent adhesiveness to the body of thermoplastic resin, and the fuel system can be provided relatively inexpensively.

In particular, as described on pages 23 and 24 of Applicants' specification, by utilizing an epoxy resin curing agent, as part of the epoxy resin composition cured to form the coating layer, as in the present claims, a good adhesiveness of the coating layer to various materials, high gasoline barrier property, flexibility and heat resistance are achieved.

Note that the multicomponent compound of (B) and the monovalent carboxylic acid of (C) respectively includes compounds having at least one acyl group which can form an amide group part by reacting with polyamine to form an oligomer, the multifunctional compound being selected from a specified group of acids and derivatives, and monovalent carboxylic acids having 1-8 carbon atoms and/or a derivative thereof. As for these components (B) and (C), note the paragraph

bridging pages 23 and 24, as well as the sole full paragraph on page 24, of Applicants' specification, describing illustrative specific materials as well as the derivatives.

It is to be noted that Applicants have incorporated the subject matter of claim 7 into claim 1, the sole independent claim in the application; and, moreover, have further defined the multifunctional compound. In view thereof, clearly the rejection of claims 1, 2 and 9-18 under 35 USC 102(b) as anticipated by Gerdes, et al., set forth in Item 2 on page 2 of the Office Action mailed April 19, 2006, is moot; and it is respectfully submitted that the rejection of claims 3-6 over the combined teachings of Gerdes, et al. and Carlblom, set forth in Item 4 on pages 3 and 4 of the Office Action mailed April 19, 2006, is moot.

In any event, Gerdes, et al. discloses a coated polymeric article, e.g., polyethylene, having reduced permeability for fuels, particularly gasoline-type fuels, characterized by a two component, preferably three component, varnish coat comprising: (a) an epoxy resin, e.g., preferably having an epoxy equivalent weight of about 150-280, (b) an effective amount of an amine-based curing agent as seen in lines 3-11 of column 2, and preferably a flexibilizer, e.g., a suitable amount of isocyanate. See column 1, line 60 to column 2, line 15. Note also column 2, lines 37-41; and column 3, lines 1-14.

It is respectfully submitted that Gerdes, et al. requires an amine-based curing agent as set forth in column 2, lines 1-11; and it is respectfully submitted that this reference does not disclose, nor would have suggested, wherein the epoxy resin composition cured to form the coating layer includes an epoxy resin curing agent as in the present claims, comprising a reaction product of (A) and (B) or reaction

product of (A), (B) and (C), or wherein the coating layer has the recited gasoline permeability coefficient.

In addition, it is respectfully submitted that Gerdes, et al. would have neither taught nor would have suggested such fuel system including the coating layer formed utilizing the curing agent as recited in the present claims, and including other features as in the other claims in the application and referred to previously.

It is respectfully submitted that the additional teachings of the secondary references as applied by the Examiner would not have rectified the deficiencies of Gerdes, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Carlblom discloses resins having gas barrier properties, and packaging materials and/or containers including barrier coatings, the coatings substantially reducing permeability of gasses such as carbon dioxide and/or oxygen through the packaging materials. See column 1, lines 10-15. This patent discloses that the coatings described therein are the cured reaction product of a polyamine with a specific polyepoxide having a structure as set forth in column 2, lines 37-45. Note column 2, lines 34-45 of this patent. See also column 4, lines 1-5; the paragraph bridging columns 5 and 6; column 7, lines 41-51; column 8, lines 51-53; and column 10, lines 18-24.

Initially, note that Carlblom is concerned with resins having carbon dioxide and/or oxygen (or the like) gas barrier properties. It is respectfully submitted that one of ordinary skill in the art concerned with fuel impervious articles, would not have looked to the teachings of Carlblom.

In any event, even assuming, arguendo, that one of ordinary skill in the art concerned with in Gerdes, et al. would have looked to the teachings of Carlblom, it is

respectfully submitted that such combined teachings would have neither disclosed nor would have suggested such fuel system as in the present claims, including wherein the coating layer is formed by curing an epoxy resin composition including the epoxy resin curing agent as in the present claims, e.g., which forms a skeletal structure as in claim 3, and advantages thereof as discussed in the foregoing.

The contention by the Examiner that Carlblom discloses an epoxy for a fuel container "for the purpose of obtaining a container having [reduced] permeability of gas", is noted. It is again noted that Carlblom reduces permeability of gasses such as carbon dioxide and/or oxygen through packaging materials. It is respectfully submitted that this reference does not disclose, nor would have suggested, either alone or in combination with the teachings of Gerdes, et al., providing a resin having a reduced gasoline permeability coefficient, and advantages thereof in connection with a fuel system as achieved by the present invention.

Miyamoto, et al. discloses a hardening agent for epoxy resins, comprising an amide amine that is a reaction product between a specified polyamine shown by the formula (I) in columns 1 and 2 of this patent, and a carboxylic acid. See column 1, lines 51-62. Note also the disclosure of carboxylic acids that can be used in Miyamoto, et al., at column 2, lines 32-68. In particular, various dicarboxylic acids are described in column 2, lines 47-51; and monocarboxylic acids are described at column 2, lines 51-65. This patent discloses that use of tall oil fatty acid is particularly preferred.

It is respectfully submitted that Miyamoto, et al., disclosing hardening agents for epoxy resins in general, and specifically to avoid problems in connection with insufficient transparency, strength and chemical resistance, would have neither taught nor would have suggested, either alone or in combination with, e.g., the

teachings of Gerdes, et al., the fuel system as in the present claims, including the epoxy resin curing agent of the epoxy resin composition of the coating layer utilized on the body of the fuel system structure, or advantages thereof in, e.g., high gasoline barrier property, good adhesiveness of the coating layer to various materials, flexibility and heat resistance.

The contention by the Examiner in Item 5 on page 4 of the Office Action mailed April 19, 2006, that Miyamoto, et al. discloses a curing agent which includes a reaction product of metaxylylenediamine and a carboxylic acid, "therefore including acrylic acid", is noted. However, it is respectfully submitted that the carboxylic acid of Miyamoto, et al. is explained in detail at, for example, column 2, lines 32-68, with illustrative carboxylic acids being set forth as polymerized fatty acids, dicarboxylic acids and monocarboxylic acids. Specific acids are set forth at column 2, lines 38-68, this patent disclosing that tall oil fatty acid is particularly preferred. Contrary to the contention by the Examiner, it is respectfully submitted that taking the teachings of Miyamoto, et al. as a whole, as required under 35 USC 103, one of ordinary skill in the art would not have been led to acrylic acid thereby, even taking into account the teachings of Gerdes, et al. and/or Carlblom. It is respectfully submitted that only through hindsight use of Applicants' disclosure, which of course is improper under 35 USC 103, would one of ordinary skill in the art have been led to use of acrylic acid.

In addition, it is again emphasized that Miyamoto, et al. is directed generally to hardening agents for epoxy resins, providing hardened products having sufficient transparency, strength and chemical resistance. It is respectfully submitted that the teachings of Miyamoto, et al., as a whole, even taken together with the teachings of Gerdes, et al., and even in light of the teachings of Carlblom, would have neither disclosed nor would have suggested use of the epoxy resin curing agent as part of

the epoxy resin composition cured to form the coating layer of the presently claimed fuel system, and/or other features of the present invention as discussed previously, including the gasoline permeability coefficient; and/or skeletal structure represented by Formula (1) contained in the coating layer, much less amount thereof contained therein, as in claim 3; and/or other features of the present invention as in the remaining dependent claims.

Furthermore, it is also to be noted that Miyamoto, et al. discloses free carboxylic acids; and it is respectfully submitted that this reference would have neither taught nor would have suggested use of derivatives of carboxylic acids, as in the present claims. Note especially claim 22.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently in the application are respectfully requested.

Applicants request any shortage in fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 396.42795X00), and credit any excess payment of fees to such Deposit Account.

Respectfully submitted,

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